Reply to Office Action of April 13, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the

application:

Listing of Claims:

Claims 1-12. (Canceled)

(Currently amended) In a fuel injection valve for internal combustion engines,

having a valve body (1) in which a bore (3) is disposed, on whose end toward the

combustion chamber a conical valve seat (9) is embodied in which at least two injection

ports (11) are disposed that connect the bore (3) to the combustion chamber, and

having a valve member (5), which is guided in the bore (3) and by imposition of

pressure by fuel on a pressure face (13) embodied on the valve member (5) is axially

movable counter to a closing force aimed at the valve seat (9) and which has a valve

member shaft (205), oriented toward the valve seat (9), between which shaft and the

wall of the bore (3) a pressure chamber (19) that can be filled with fuel is embodied,

which valve member (5), on its end toward the combustion chamber, has a valve

member tip (7) on which a first conical face (30) and a second conical face (32)[[,]]

adjoining the first conical face (30) toward the combustion chamber[[,]] are [[is]]

embodied, the second conical face (32) adjoining the first conical face (30) and being

located downstream of the first conical face (30) in terms of fuel flow to the injections

ports, and the cone angle (α) of the first conical face (30) is less, and the cone angle

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(β) of the second conical face (32) is greater, than the cone angle (γ) of the valve seat

(9), and having an annular groove (35), extending all the way around the valve member

tip (7), the first groove edge (38) of the annular groove (35) which is located in a radial

plane to the axis of the valve member (5) and on the first conical face (30), and the

whose second groove edge (39) of the annular groove (35) is located in a radial plane

to the axis of the valve member (5) and on the second conical face (32), and the first

groove edge (38) of the annular groove (35) is embodied as a sealing edge, which in

the closing position of the valve member (5) comes into contact with the valve seat (9)

upstream of the fuel flow to the injection ports (11), the improvement comprising an

additional annular groove (42) on the second conical face (32) of the valve member tip

(7), the additional annular groove (42) [[(47)]] at least partly covering the injection ports

(11) both in the closing position and in the open position of the valve member (5).

14. (Currently amended) The fuel injection valve of claim 13 wherein the cross section

of the additional annular groove (42) is greater than or equal to the cross section of an

injection port (11).

15. (Previously presented) The fuel injection valve of claim 13 wherein that a first

differential angle (δ_1), located between the first conical face (30) and the valve seat (9),

is smaller than a second differential angle (δ_2), located between the valve seat (9) and

the second conical face (32).

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16. (Previously presented) The fuel injection valve of claim15 wherein the first

differential angle (δ_1) and the second differential angle (δ_2) amount to less than 1.5°.

17. (Currently amended) The fuel injection valve of claim 13 wherein the cone angle

(γ) of the valve seat (9) amounts to from 55 to 65°, preferably approximately 60°.

18. (Previously presented) The fuel injection valve of claim 13 wherein the groove

edges (44; 46) of the additional annular groove (42) are located in planes radial to the

valve member axis (50) of the valve member (5).

19. (Previously presented) The fuel injection valve of claim 13 wherein the conical face

adjoining the groove edge (46), remote from the combustion chamber, of the additional

annular groove (42) partly covers the injection ports (11) in the closing position of the

valve member (5).

20. (Previously presented) The fuel injection valve of claim 14 wherein the conical face

adjoining the groove edge (46), remote from the combustion chamber, of the additional

annular groove (42) partly covers the injection ports (11) in the closing position of the

valve member (5).

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21. (Previously presented) The fuel injection valve of claim 15 wherein the conical face

adjoining the groove edge (46), remote from the combustion chamber, of the additional

annular groove (42) partly covers the injection ports (11) in the closing position of the

valve member (5).

22. (Previously presented) The fuel injection valve of claim 16 wherein the conical face

adjoining the groove edge (46), remote from the combustion chamber, of the additional

annular groove (42) partly covers the injection ports (11) in the closing position of the

valve member (5).

23. (Previously presented) The fuel injection valve of claim 13 wherein the injection

ports (11) are located in a common radial plane relative to the valve member axis (50).

24. (Previously presented) The fuel injection valve of claim 13 wherein the groove

edges (44; 46) of the additional annular groove (42) and the injection port outlets are

in a plane that is inclined to the radial plane of the valve member axis (50).

25. (Currently amended) The fuel injection valve of claim 13 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one [[in]] longitudinal groove (55) extending along jacket lines of the

second conical face (32).

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26. (Currently amended) The fuel injection valve of claim 14 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one [[in]] longitudinal groove (55) extending along jacket lines of the

second conical face (32).

27. (Currently amended) The fuel injection valve of claim 15 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one [[in]] longitudinal groove (55) extending along jacket lines of the

second conical face (32).

28. (Currently amended) The fuel injection valve of claim 16 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one [[in]] longitudinal groove (55) extending along jacket lines of the

second conical face (32).

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29. (Currently amended) The fuel injection valve of claim 17 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one [[in]] longitudinal groove (55) extending along jacket lines of the

second conical face (32).

30. (Currently amended) The fuel injection valve of claim 18 further comprising at least

one longitudinal groove (55) connecting the two annular grooves on the conical face

disposed between the annular groove (35) and the additional annular groove (42), each

said at least one in longitudinal groove (55) extending along jacket lines of the second

conical face (32).

31. (Currently amended) The fuel injection valve of claim 25 wherein a plurality of

longitudinal grooves (55) are more than one longitudinal groove (55) is embodied on the

second conical face (32), said longitudinal grooves being distributed uniformly over the

circumference.

32. (Previously presented) The fuel injection valve of claim 31 wherein at least one of

said longitudinal grooves (55) extends at an incline to the jacket lines of the second

conical face (32).

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